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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/620,863	07/15/2003	Niranjan Thirukkvalur	200208989-1	9129

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EXAMINER

RUTHKOSKY, MARK

ART UNIT	PAPER NUMBER
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1745

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/25/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/620,863

Applicant(s)

THIRUKKOVALUR ET AL.

Examiner

Mark Ruthkosky

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 26 October 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 31-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 31-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nanjo et al. (JP 2001-052,727.)

The instant claims are to a fuel cell system, comprising at least first and second fuel cells, each of the fuel cells having at least one reactant inlet line and at least one output outlet; and a first heater arrangement operably connected to the at least one output outlet of the first fuel cell and associated with the at least one reactant inlet line of the second fuel cell such that heat from the first heater arrangement is transferred to reactants in the at least one reactant inlet line of the second fuel cell.

Nanjo et al. (JP 2001-052,727) teaches a fuel cell system comprising a fuel cell having at least one reactant inlet line and at least one output outlet, and a first and second heater arrangement operably connected to the at least one output outlet of the fuel cell and associated with the at least one reactant inlet line of the fuel cell, such that heat from the heater arrangement is transferred to reactants in the at least one reactant inlet line of the fuel cell (see the abstract.) Heaters are disclosed at the fuel and oxidant inlets of the fuel cell (see the figures, including figure 1 and the corresponding text.) Additional reactant sources are located downstream from

Art Unit: 1745

the heater at an inlet valve arrangement as taught in figure 4. The reactant lines include recycling valves for exhaust flow to a burner and to a valve in the oxidant inlet line upstream from the heater (figures 1-4.)

Nanjo et al. (JP 2001-052,727) does not teach a fuel cell system comprising at least first and second fuel cells, wherein a heater arrangement is operably connected to the at least one output outlet of the first fuel cell and associated with the at least one reactant inlet line of the second fuel cell such that heat from the first heater arrangement is transferred to reactants in the at least one reactant inlet line of the second fuel cell. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the heating process of Nanjo et al. (JP 2001-052,727), which teaches using the exhaust of a fuel cell to heat the reactant at the inlet of the same fuel cell, to heat the reactants of another fuel cell. Preheating the reactants for the fuel cell provides improved generating efficiency and use effectiveness of the fuel cell (paragraph 7.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to heat an identical fuel cell using the methodology taught in Nanjo et al. (JP 2001-052,727), as it will heat the fuel cell reactants in an equivalent manner. With regard to claim 4, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the heating process of Nanjo et al. (JP 2001-052,727), which teaches using the exhaust of a fuel cell to heat the reactant at the inlet of the same fuel cell, to heat the reactants of multiple fuel cells, as preheating the reactants provides improved generating efficiency and use effectiveness of the fuel cell, as previously noted, (see paragraph 7.) The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 31-35 and 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nanjo et al. (JP 2001-052,727), as previously applied, in view of Gagnon (US 4,098,960.)

Nanjo et al. (JP 2001-052,727) teaches a fuel cell system comprising a fuel cell having at least one reactant inlet line and at least one output outlet, and a first and second heater arrangement operably connected to the at least one output outlet of the fuel cell and associated with the at least one reactant inlet line of the fuel cell, such that heat from the heater arrangement is transferred to reactants in the at least one reactant inlet line of the fuel cell (see the abstract.) Heaters are disclosed at the fuel and oxidant inlets of the fuel cell (see the figures, including figure 1 and the corresponding text.) Additional reactant sources are located downstream from the heater at an inlet valve arrangement as taught in figure 4. The reactant lines include recycling valves for exhaust flow to a burner and to a valve in the oxidant inlet line upstream from the heater (figures 1-4.)

Nanjo et al. (JP 2001-052,727) does not teach an inlet valve associated with the at least one reactant inlet line of a second fuel cell and located downstream from the first heater arrangement; and an isolation valve associated with the at least one reactant inlet line of the second fuel cell and located upstream from the first heater arrangement. Gagnon (US 4,098,960) teaches a fuel cell control system for a plurality of fuel cells aligned in series wherein each fuel cell includes valves both upstream and downstream from the individual fuel cells in the system (see figure 2.) The fuel cells may be individually isolated from one another and the system by closing the valves. The system includes a main reactant inlet line and individual inlet lines for each individual fuel cell (figure 2.) A controller is taught to include a processor, an actuator,

Art Unit: 1745

pressure sensors and a valve system (see the claims, figures 1-2 and col. 7.) It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the heating process of Nanjo et al. (JP 2001-052,727), which teaches using heat from the reactant exhaust of a fuel cell to preheat the reactants at the inlet of the fuel cell, to heat the reactants of a subsequent fuel cell in the arrangement taught in the invention of Gagnon using the preheating system of Nanjo. Preheating the reactants for the fuel cell provides improved generating efficiency and use effectiveness of the fuel cell (paragraph 7, abstract.) From this, it would be obvious to one of ordinary skill in the art to use exhaust heat from one fuel cell to heat the reactants for a subsequent fuel cell. It would have been obvious to one of ordinary skill in the art at the time the invention was made to heat an identical fuel cell using the methodology taught in Nanjo et al., as it will heat the fuel cell reactants in an equivalent manner by using the exhaust of a fuel cell to heat the reactant at the inlet of an adjacent fuel cell. Using a valve arrangement to isolate the individual fuel cells is well described in Gagnon. One of ordinary skill in the art would understand from this teaching in the art that fuel cells may be bypassed or isolated from use in the system because a fuel cell or a number of fuel cells are not needed to power a lower energy load or to isolate a fuel cell that has malfunctioned. It would have been obvious to one of ordinary skill in the art at the time the invention was made to place valves in the system, as taught in Gagnon to allow for heating of the fuel cell or to prevent heating of a fuel cell if it is not in use. The art would have found the claimed invention to be obvious in light of the teachings of the references.

With regard to the operation of the system and function of the controller, it is noted that the prior art teaches a controller as noted in Gagnon. The process of operating the fuel cell does

Art Unit: 1745

not further limit the product, a fuel cell. MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process."

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nanjo et al. (JP 2001-052,727), as applied to the above claims, in view of Wheat (US 2003/0049504.)

The teachings of Nanjo et al. (JP 2001-052,727) have been presented. The reference does not teach the heater to be electrically powered. Wheat (US 2003/0049504), however teaches a heater for heating the stack and the reactants that is electrically powered (claims 1-2, paragraph 15.) Electricity is added to the heater and the resistance of the materials produces heat. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an electric heater to heat the reactants of the fuel cell taught in Nanjo, as the heater provides improved generating efficiency and use effectiveness of the fuel cell (paragraph 7.) Using an electric heater would be obvious to one of ordinary skill in the art to provide heat.

The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Response to Arguments

Applicant's arguments filed 10/26/2006 have been fully considered but they are not persuasive. Applicant argues that the modification of the prior art is based on nothing more than

Art Unit: 1745

the examiner's opinion and the allegation that there is nothing in the prior art of record that remotely suggests the purportedly obvious modification of the prior art. This argument is not persuasive because the prior art teaches the means and the desirability for heating a fuel cell reactant by using the exhaust of a fuel cell in a heat exchanging relationship. This same means may be used to heat the reactants for another fuel cell by using the exhaust of a first fuel cell in the heat-exchange arrangement taught in the art. The motivation to modify the reference is to provide heat to a fuel cell reactant, which is taught in the art to give improved generating efficiency and use effectiveness in the fuel cell, as noted in the rejection. One of ordinary skill in the art would be motivated to modify the teachings in order to give these improvements to a fuel cell or additional fuel cells in the same system. As each fuel cell operates, it generates more heat, which may be efficiently used, as taught in the prior art, to heat the inflow of reactants for subsequent fuel cells using the heater arrangement taught in Nanjo et al. (JP 2001-052,727.)

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

Art Unit: 1745

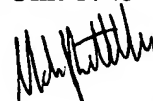
CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Examiner Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free.)

Mark Ruthkosky
Primary Patent Examiner
Art Unit 1745


1.18.2007